

# Healthy Country

managing the land for healthy waterways



## Agricultural benchmarking report

Pumicestone catchment

June 2010

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# **Agricultural benchmarking report**

**Pumicestone catchment**

**June 2010**

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and Innovation

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# Executive summary

To determine the current level of adoption of best management practices (BMP) 71 agri-businesses were benchmarked. The benchmarking process surveyed a horticulture, grazing and meat chicken producers in the Pumicestone during November 2009 to June 2010. The assessment classified enterprises in accordance with the ABCD/ 1234 Framework for South East Queensland horticulture and grazing and the Meat Chicken Industry EMS.

Twenty-one producers (30%) were classified as managing their natural resources at a B class level (best current recommended practice), with macadamias and strawberries being the best performing industries in the catchment. Considering there were another 40 enterprises approaching B class (C+) suggests that adoption of BMP is becoming core business for over three-quarters of producers in the Pumicestone. Further, there were no producers classified as D class in overall ratings.

Thirty-six percent of growers are adopting B class soil and sediment management practices, with nearly half from the macadamia industry. Forty-eight percent of horticulture enterprises (C+ rated) are moving away from conventional soil and sediment management practices (C class) and towards B class practices, with only 17% of enterprises practicing C class soil and sediment management.

Twenty-nine percent of horticulture industries in the Pumicestone are practicing B class nutrient management, which highlights enhanced adoption of input efficiencies through timing, application rates, equipment calibration, and record keeping practices and reduced losses through sound fertiliser storage. Fifty-four percent

of the participants are rated as C+ (approaching B class) nutrient management practices with 17% of enterprises remaining at conventional industry practices (C class).

B class irrigation and drainage management was at 33%, with 51% of enterprises approaching B class management practices on their properties.

The results indicate the investment the Pumicestone FarmFLOW Project has delivered enhanced levels of BMP adoption to reduce non-urban diffuse source pollution. This has combined with broader catchment initiatives to achieved quantifiable improvements in the ecosystem health indicators for freshwaters of the Catchment as indicated by the 2008 and 2009 Healthy Waterways Report Cards.

The benchmarking process has identified areas for future focus, due to current low levels of adoptions. Specific practices which require a continued focus on improvement are; overland flow capture, appropriate filter and buffer strips (grassed headlands), inter-row, fallow, and groundcover management, minimising tillage practices, calibration of fertiliser spreading and fertigation equipment, efficient fertiliser use, nutrient budgeting, and bulk fertiliser storage techniques.



**Photo:** Better Soils workshop held at Landsborough Town Hall and Newell's Macadamia farm on 25th February 2010. Twenty-six local growers attended the hall for the practical hands-on session and the farm walk/soil pits session.

# Introduction

During the period from November 2009 to June 2010 a total of 71 farms were benchmarked to determine their current level of adoption of Best Management Practices (BMP) against an ABCD/1234 Framework for Horticulture and Grazing in South East Queensland. This framework was developed by DEEDI and peer reviewed by industry, peak bodies and growers. Chicken meat Producers were benchmarked using their Industry EMS.

The Pumicestone FarmFLOW project has undertaken previous BMP benchmarking exercises during 2007/8 (29 growers) and 2008/9 (57 growers) which will be used as a baseline for 2010 reporting. The benchmarking interview process covered all the major agriculture and horticulture industries from Caboolture to Caloundra. Previously benchmarking was based on enterprisers that were either already involved in the project, or participated in local catchment care groups and/or community awareness groups.

As the project evolves and the grower networks expand, the project is engaging with enterprises that have not been engaged in the BMP extension effort previously. A majority of the newly benchmarked properties in 2010 had very little or no knowledge of the project and have had little or no extension engagement on BMP for their industry. Therefore the data sets are more reflective of the broader trends within the horticulture industry in the catchment.

## ABCD/1234 framework

The benchmarking utilised a four scale classification system for practices, in horticulture these classes range from A to D, and in grazing they range from 1-4 (to avoid confusion with ABCD land condition rating). The framework classifies practices based on their ability to achieve improvements in resource condition (i.e. reduce degradation) and their consequent impact on farm profitability.

D (4) class practices are dated practices that have unacceptable risk of potential impacts on the surrounding environment or that will ultimately lead to degradation of resources and a decline in profitability in the short to medium term.

C (3) class practices are conventional management practices that reduce the risks/impacts compared to class D however, are unlikely to lead to an acceptable resource condition if applied widely and hence lead to reduced profitability in the medium to long term.

B (2) class practices are those that are the currently recommended best management practices which have been demonstrated to minimise risk off farm and resource degradation and can lead to improvements to profitability in the short to medium term.

A (1) class practices are aspirational practices that are relatively recent innovation which further minimise risks and potential degradation compared to B class practices but require further studies to validate their impact on resource condition and profitability.

To arrive at a rating for an enterprise across a range of practices a scoring system was used. For each enterprise a score was assigned to each practice as follows A=6, B=4, C=2, D=0, to assist as the methodology. These scores were averaged across each management theme i.e. Soil and Sediment Management, Nutrient Management and Irrigation and Drainage Management. To facilitate identification of properties which were transitioning from C to B Class practices these scores were used to create intermediate class between B and C classifications (C+).

The benchmarking process is part of the implementation for the broader FarmFLOW framework in the catchment. Adoption is therefore linked to the investment into the Pumicestone over the last four years including:

- \$75 000 in grower incentives to assist Best Management Practice (BMP) changes to farm operations focusing on nutrient and sediment management.
- A recent incentives program rolled out in October delivering funding to ten Pumicestone growers across six crop types.
- A strawberry BMP growers manual—the first in Queensland.
- Funding of \$205 000 through Caring for Our Country.
- 18 farm-trial case studies covering nutrient management and sediment and erosion control issues.

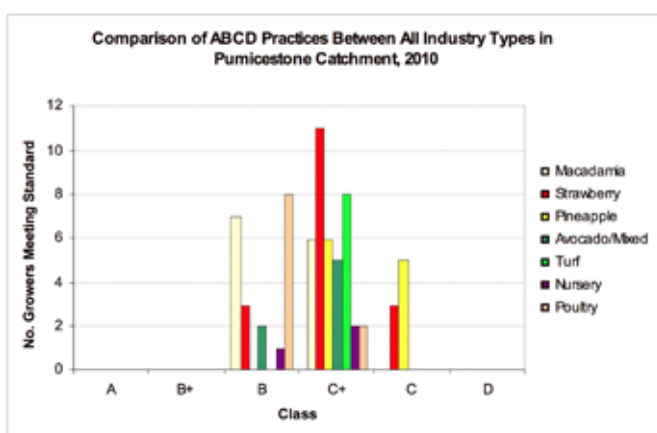
# Results

## Benchmarking results across all industries

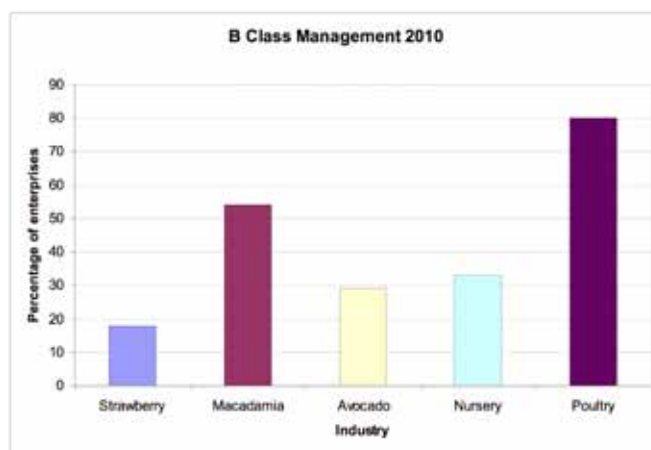
The data sets generated from the grower interviews where the ABCD Framework was the basis for conversation, has established a real time and conclusive benchmark of where key management practices sit with Pumicestone enterprises.

Over the past 4 years agriculture enterprises in the Pumicestone have been making steady progress towards adopting soil and nutrient BMPs as a whole of farm approach to natural resource management. Thirty percent (21 of 71) of farms surveyed over two or more years had reached overall rating of B Class in the 2010 survey. Considering there were another 40 enterprises approaching B class (C+) suggests that adoption of BMP is becoming core business for over three quarters of producers in the Pumicestone. Drawing from past benchmarking reports the key areas where improvements are making an impact are in the pineapple, strawberry and macadamia industries (Figure 1).

The best performing B class horticulture industries benchmarked in the catchment were macadamias and strawberries (Figure 1). Other B class enterprises were avocados/mixed tree crops and a nursery. While tree crops (Macadamias and Avocado) have 43% of the enterprises rated as B class, no pineapples and turf have achieved this overall rating to date. The relative proportion of each industry in B Class is indicated in Figure 2. This shows that 54% of macadamias, 29% of avocados, and 18% of strawberry enterprises are achieving B class management practices. While 40% of poultry growers in the catchment were rated as B class, the process to benchmark poultry growers has a narrower focus on their EMS criteria compared to the ABCD framework.



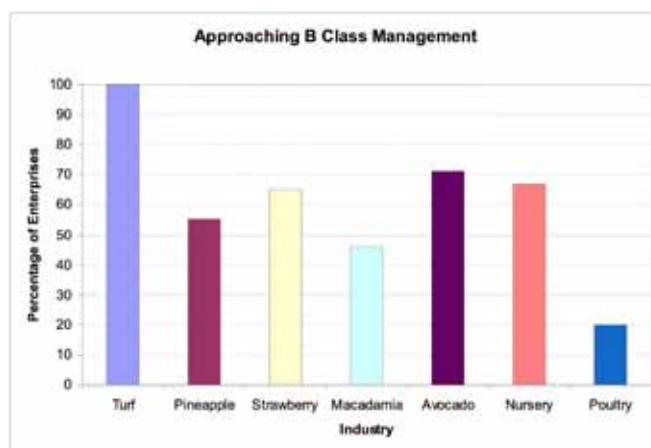
**Figure 1.** Cumulative figures for all industries surveyed in the Pumicestone Catchment for 2010. The survey results were based on the ABCD framework where 71 growers were benchmarked; with turf (8), pineapple (11), strawberry (17), macadamia (13), mixed tree crops (7), poultry (10), and nursery (3). Two graziers were benchmarked using the 1234 classification for grazing.



**Figure 2.** Industry by industry breakdown of the 21 enterprises rated as B class for 2010.

An encouraging result was that 40 enterprises were classified as C+ which suggests they are adopting recommended B class practices for at least some of the management themes (Figure 3). The industry by industry breakdown indicates that BMP change/adoption is occurring in all industries.

From a sustainable agriculture and natural resource management perspective the nil result for D class growers in the overall rating is a positive trend (Figure 1). Only eight of the 71 growers (11%) benchmarked rated as C class overall. A continued focus on pineapple (45% C class) and strawberry (18% C Class) industries is justified by these findings (Figure 1).



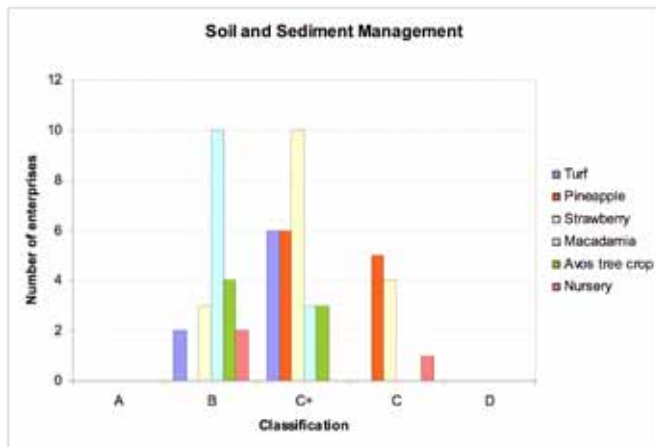
**Figure 3.** Percentage of benchmarked growers in each industry classified as (C+) approaching B class management.

## Benchmark for each management practice theme

One of the biggest advantages of the ABCD framework is that it helps to identify target practices for extension initiatives. Figures 4-6 identify performance on an industry by industry basis across the three broad management themes benchmarked.

Thirty-six percent (21) of growers are adopting B class soil and sediment management practices with nearly half of these enterprises from the macadamia industry (10). Forty-eight percent of horticulture enterprises (C+ rated) are moving away from conventional soil and sediment management practices (C class) and towards B class practices is evident. Importantly only 17% of enterprises are practicing C class soil and sediment management.

Growers practicing C class soil and sediment management were from the pineapple (5 of 11), strawberry (4 of 17), and one nursery which made up 17% of the enterprises benchmarked (Figure 4). Pineapples have the highest participation rates for C class practice use.

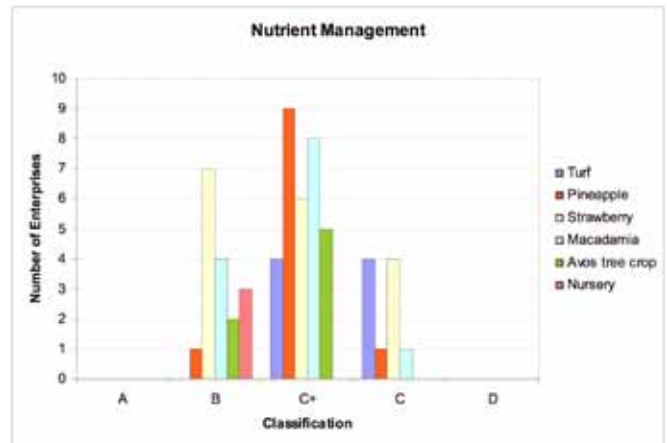


**Figure 4.** Soil and sediment management benchmark results for all horticulture industry in 2010. Note: i. Fifty-nine participants were surveyed for this section ii. Grazing and Poultry enterprises have not been included.

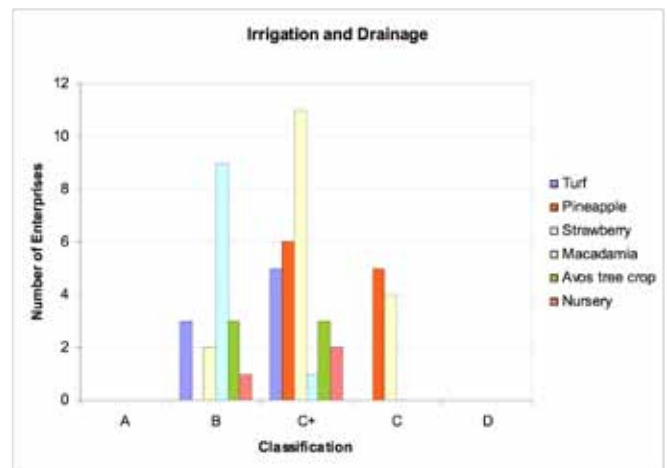
Twenty-nine percent of horticulture industries in the Pumicestone are practicing B class nutrient management, which highlights enhanced adoption of input efficiencies through timing, application rates, equipment calibration, and record keeping practices and reduced losses through sound fertiliser storage (Figure 5). Turf and strawberry industries have the highest participation rates of growers still utilising C class practices (Figure 5).

Fifty-four percent (32 of 59) of the participants are rated as C+ which suggests the majority of enterprises are in the transition to BMP for nutrient management practices. Pineapple and macadamia enterprises showed the most significant improvement when compared to previous reports. Seventeen percent of enterprises are classified as C class growers (Figure 5).

The number of enterprises practicing B class irrigation and drainage management during 2010 was 18 (33%). Significantly 51% of enterprises (28 of 55) are approaching B class management practices on their farms, while only pineapple (5) and strawberry (4) enterprises continuing to use conventional (C class) industry practices (Figure 6).



**Figure 5.** Nutrient management benchmark results for all horticulture industry in 2010. Note: Fifty-nine participants were surveyed for this section.



**Figure 6.** Irrigation and drainage benchmark results for all horticulture industry in 2010. Note: Fifty-five participants were surveyed for this section.

## Benchmark by industry

### Strawberries

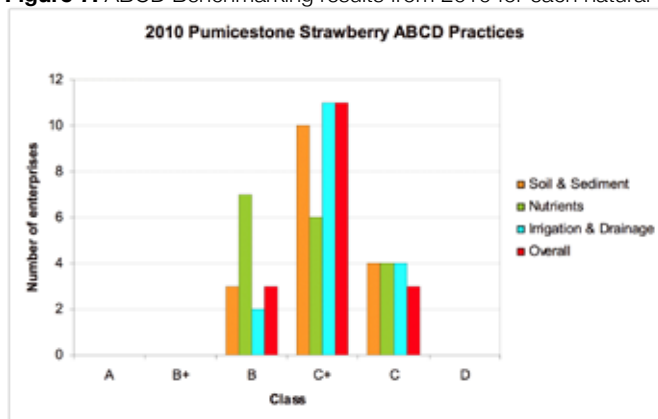
The Queensland strawberry industry has a large presence in the Pumicestone Catchment with 68 growers at last count (pers comm. L. Grobler, QSGA). The past few years have been financially tough for strawberry growers with unseasonal heavy rains and disease disrupting production cycles.

Seventeen strawberry producers (25% of the Pumicestone industry) were benchmarked in the catchment during the last 9 months. Three enterprises were uniformly adopting BMP (B class) which represents 17% of surveyed growers. However the majority of those sampled (65%) were rated as C+ which shows progress toward this aim. Encouragingly only three growers (17%) management practices were adopting only conventional C class practices (Figure 7).

The best results to emerge from this survey were that seven growers (41%) are adopting BMP for nutrient management, and eight growers (47%) were approaching B class for their irrigation and drainage (Figure 7).

The results table highlights that much work is still to be done for soil and sediment management with eight growers (47%) receiving C+ rating, and four growers practicing C class resource management (Figure 7). The particular practices which require extra effort are bulk fertiliser storage (poultry litter in particular), inter-row cover to protect the top soil (problems with cost of wood chip and lack of identified suitable fast growing winter grasses) and nutrient budgeting to account for the total nutrient pool.

**Figure 7.** ABCD Benchmarking results from 2010 for each natural



resource management stream for the Pumicestone strawberry industry.

An opportunity to benchmark a subset of growers at the QSGA general meeting occurred on the 4th May, 2010. Using a new computer software technology called Keepad Interactive we simultaneously benchmarked growers on a range of management practices as described in the ABCD framework. This survey suggests across the industry 55% of producers utilise grassed headlands and buffer strips to slow runoff and trap sediment, 53% employ sediment traps to capture and settle overland flow, 42% rely on agronomists to determine fertiliser rates, 42% use less aggressive tillage options, and 39% get regular soil tests to assist nutrient budgeting (Appendix).

### Turf

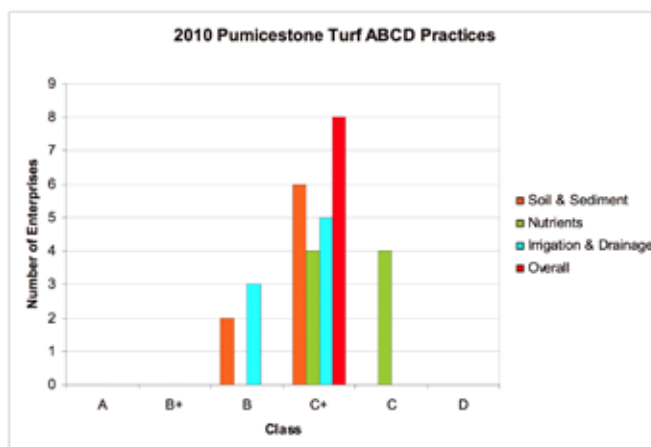
Eight turf growers were benchmarked during 2010. With a change in benchmarking classification for 2010 it is harder to gauge where on-farm management practice improvements have come about. The barriers to adoption include unfavourable growing conditions during summer/autumn, new farms establishing and new owners taking over existing farms.

The Qld Turf Producers Association (QTPA) has recently developed a BMP guide specifically targeted at growing turf, due for release in mid 2010.

Industry ABCD benchmark results for turf highlight that eight growers (100%) are displaying C+ management practices (Figure 8). Turf producers are performing well with irrigation and drainage management with 38% classed as B class and 62% as C+ (Figure 8). Soil and sediment management was next best with 25% practicing B class management and 75% classed as C+. Nutrient management remains an issue for turf growers with 50% adhering to the conventional industry practices (C class).

The areas where improvement is needed within the turf industry lie with the current C class practices including: adequate fertiliser

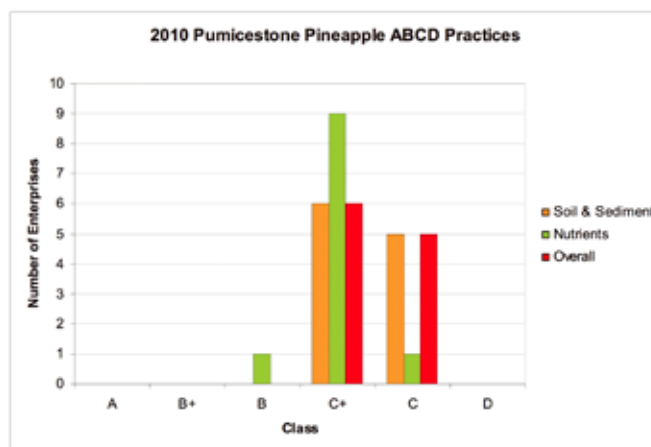
storage (bunded areas for poultry litter), efficient fertiliser application (responding to test results as opposed to reliance on broad industry standards), and calibration of fertiliser spreading equipment.



**Figure 8.** ABCD benchmarking of the Pumicestone turf industry for 2010. Note; Eight turf farms were surveyed.

### Pineapples

Eleven pineapple growers were benchmarked during the year. The results are promising and highlight continuous improvement in the adoption of BMP. While none of the surveyed farms were adopting BMP uniformly across all three themes the majority (54%) had made progress towards this target classified as C+ overall (Figure 9).



**Figure 9.** ABCD benchmarking of the Pumicestone pineapple industry for 2010. Note: Eleven pineapple growers were benchmarked.

Pumicestone pineapple enterprises performed better in nutrient management themed practices than they did in soil and sediment practices, which is still a key area for the industry to address. Eighty percent of enterprises managed nutrients at a C+ level with one enterprise considered to manage at a B class, compared to 55% who had adopted C+ management for soil and sediment practices (Figure 9). The remaining 45% enterprises could reduce soil erosion and sediment loss by around 60 tonnes per ha by just adopting inter-row cover at time of planting.



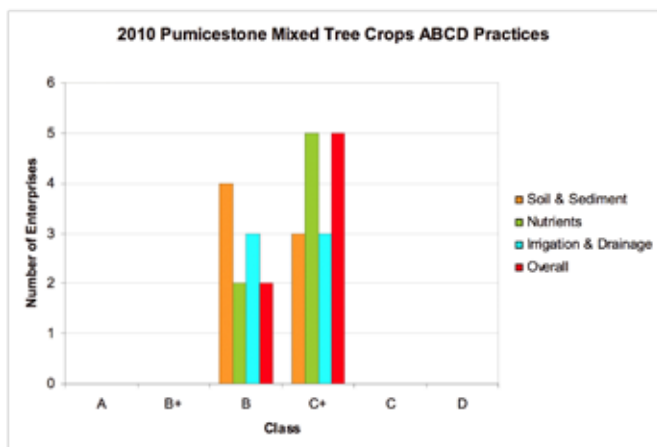
There are several key management practices within the industry that require attention to help growers move beyond conventional industry practices. These practices are inter-row cover, tillage practices, filter and buffer strip management, and more efficient fertiliser use. The project will continue to look for solutions to assist growers to uptake and improve their current management practice in these areas.



**Figure 10.** Drain redesign on a pineapple farm using geo-fabric as a soil surface stabiliser and later planted out with vetiver grass to aid stabilisation.

#### Mixed tree crops avocado, custard apple, lychee and mango

Seven mixed tree croppers were benchmarked against the ABCD framework during 2010. The results for these enterprises and industry are very positive. Fifty-seven percent of the enterprises had adopted BMP for soil and sediment management, 29% at B Class for nutrient management, and 43% at this level for irrigation and drainage practices (Figure 11).



**Figure 11.** ABCD benchmarking of the Pumicestone avocado and mixed tree crops for 2010. Note: Seven growers were benchmarked for all three management sections.

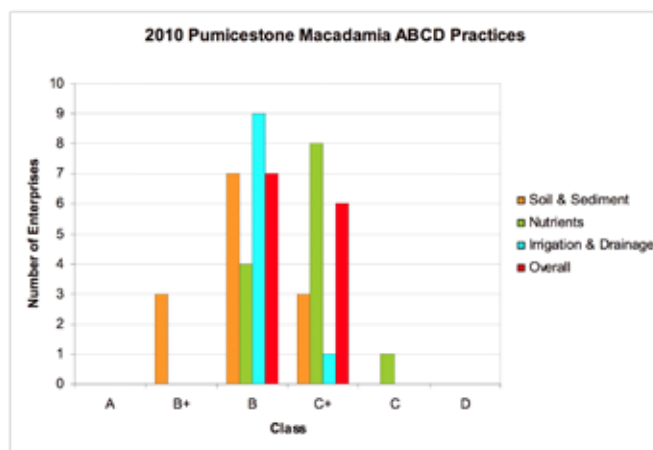
In this industry aggregate data suggests there was no one operating at a C Class or below in any of these management themes. Overall results indicate that two growers manage their orchards at a B class standard, while four others manage at a C+ standard. The one area remaining to focus on improved practice is the management of overland flow from the orchard which was classified as a C+ across the growers (Figure 11).

#### Macadamias

The macadamia industry is relatively small in the Pumicestone Catchment, with around 20 farms in production. This industry does not have a BMP guide but a grower's handbook that was released in 2004 by QPIF provides some useful guidelines. The handbook focuses briefly on nutrient management and erosion management.

As an industry, 13 macadamia growers from the catchment were benchmarked against the ABCD framework. Macadamias were the best performing industry benchmarked with three growers (23%) adopting greater than B class management practices for their soil and sediment, while seven others (54%) were classified as B class. The industry sample also performed well in irrigation and drainage practices with nine growers (69%) classified as B class. The nutrient management section received four B class and one C+ enterprise (Figure 12).

The specific management practices that received C classification across the industry were overland flow management, where most growers have diverted their overland flow but have not incorporated headlands and farm drain management as buffer strips designed to recommendations. Another practice was considered C class was the calibration of fertiliser spreading equipment. Most growers felt they operated the equipment as efficiently as possible, and this was adequate.



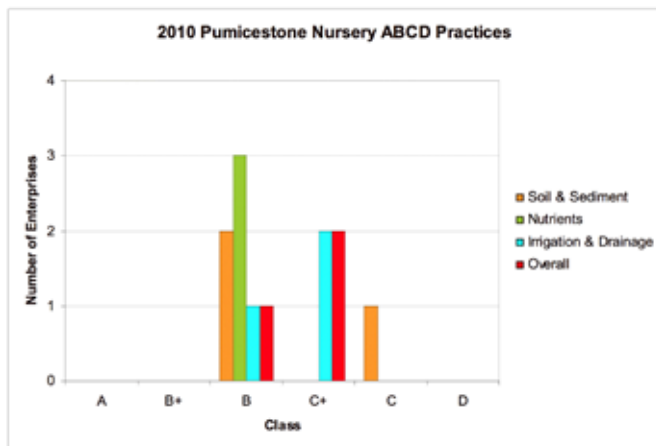
**Figure 12.** 2010 ABCD benchmarking results for the macadamia industry. Note: A total of thirteen growers were benchmarked for soil and sediment and nutrient practices, while only 10 of these growers were benchmarked for irrigation and drainage.



**Figure 13.** Canopy management using selective limb removal in a Macadamia orchard. Notice the light penetration to the orchard floor where operation is occurring. Managing the light levels into your orchard allows groundcovers to establish which reduces the erosion potential.

### Nursery

In Queensland the nursery industry is represented by the Nursery and Garden Industry Qld (NGIQ). The national nursery industry organisation (Nursery and Garden Industry Australia) has developed an environmental guideline called Ecohort which is to be incorporated into the existing Nursery Industry Accreditation Scheme Australia (NIASA). In the Pumicestone catchment three nurseries were benchmarked against the ABCD framework for their BMP adoption. The results indicate similarities between all businesses. All displayed B class nutrient management and B or C+ management of their irrigation and drainage practices (Figure 14).



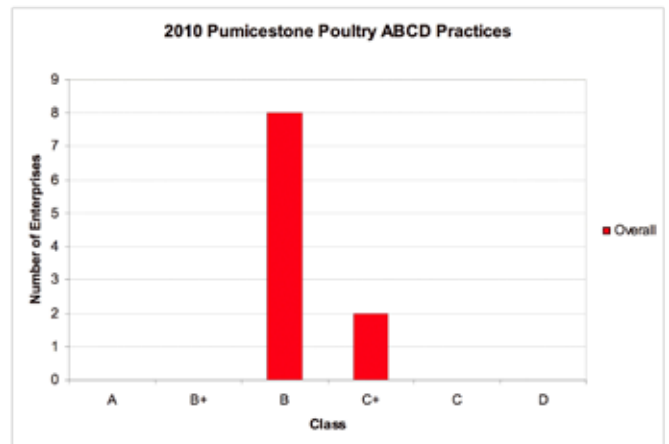
**Figure 14.** 2010 ABCD benchmarking results for Pumicestone nurseries. Note: Three enterprises were benchmarked against the ABCD framework.

### Meat chicken

Poultry production in the Pumicestone Catchment is dominated by meat chicken producers. Hatcheries and egg layers are also present and managed by Woodlands Enterprises. To date the latter group have not become engaged in the project.

Intensive poultry operations are an environmentally relevant activity (ERA) under the Environmental Protection Act 1994 and the Environmental Protection Regulation 1998. A National EMS developed by the Rural Industries Research and Development Corporation (RIRDC) for the meat chicken industry has been developed and has been rolled out to some of the growers in the region.

From 2008-2010 we have increased our levels of engagement with the poultry industry from four growers to ten. Using the evaluation tools available eight growers were considered to be operating at B class, while two growers were classified as C+ (Figure 15). The increase in poultry producers benchmarked provides a more robust data set to compare their practices against those recommended in the Meat Chicken EMS and the FarmFLOW ABCD framework. With this in mind the benchmarking sets focus on those practices relevant to sediment, water and nutrient management.



**Figure 15.** 2010 ABCD benchmarking of the Pumicestone poultry industry. Note: Ten growers were benchmarked for practices that were relative to the ABCD framework.

### Grazing

The project has engaged with two graziers to date. One is a lifestyle grower while the other grazier is a semi-commercial enterprise. The grazing benchmark uses the 1, 2, 3, and 4 rating system, to determine the resource management practices of the respective graziers. A rating 1 indicates the grazier is managing above the recommended best practice while a rating 4 indicates the landscape is severely degraded. The lifestyle grazier was rated at a 2.5 (C+ equivalent), while the semi-commercial grazier was rated as a 2 (B class equivalent). Due to the small sample size data is not published for privacy reasons.

# Conclusion

The 2010 benchmark shows a positive trend in BMP adoption with over three-quarters of producers in the Pumicestone adopting best management practices in some form. It is clear from the data that these practices are starting to become core business rather than the province of the innovators and early adopter farmer groups.

Some industries are adopting the suite of best management practices more consistently than others. Some industries are regulated and others that sell fresh fruit like avocados and strawberries are required to have and meet the standards set out in Food Safety Code of Practice (e.g. Freshcare) that require water, soil, fertiliser and chemical use records be kept. The codes associated with these processes assist business in remaining vigilant and efficient and predispose them to more rigorous farm management processes.

The results from this round of ABCD benchmarking indicate the investment the Pumicestone FarmFLOW Project has put towards participatory action learning and capacity building for agri-industries is achieving enhanced adoption of BMP to improve on farm productivity while reducing rural diffuse pollution.

Both the 2008 and 2009 Healthy Waterways Report Card shows that freshwater streams in the Pumicestone have improved in a number of ecosystem health indicators. The results are a credit to Pumicestone growers working on fulfilling their duty of environmental care, and a further indication of the success of the FarmFLOW approach in achieving catchment management outcomes.

There were two key results from this benchmarking exercise:

- 29.58 % of horticulture producers are adopting BMPs for soil and sediment, nutrient, irrigation and drainage in the Pumicestone
- 13 horticulture producers were classified as managing at a B class level overall with macadamias the best performed followed by strawberries and avocados

indicating BMPs are becoming core business of these producers.

From the data over the last three years it would appear the pineapple industry is moving the slowest towards BMP adoption. However, Industry Development Officers and Extension Officers aligned to the pineapple industry for a more prolonged period suggest there has been marked improvement in production systems in recent years (pers. com. T. Wolens and S. Newett).

The benchmarking exercise gives a clear indication of where efforts should be targeted. Future extension and incentive activities should focus on specific management practices including:

- better management of overland flow
- appropriate filter and buffer strips (grassed headlands)
- inter-row and fallow groundcover management
- tillage practices, calibration of fertiliser equipment and fertigation equipment
- increasing efficiencies in fertiliser regimes.

On the whole the 2010 benchmark shows relatively high levels of adoption considering the modest level of investment in extension and incentives in the catchment.

## Appendix

Keepad Interactive Turning Point ® questionnaire session at the Queensland Strawberry Growers Association general meeting on 4<sup>th</sup> May, 2010.

### **ABCD Soil and Sediment Practices**

**Which of the following best describe your fallow management practice?**

	<b>Responses</b>	
	<b>(percent)</b>	<b>(count)</b>
No cover to prevent soil loss between crops	11.76%	2
Weedy cover allowed to establish between crops	5.88%	1
Cover crop/green manure grown on fallow fields	76.47%	13
Don't know – don't understand question	5.88%	1
<b>Totals</b>	<b>100%</b>	<b>17</b>

**Which of the following best describes your tillage practices?**

	<b>Responses</b>	
	<b>(percent)</b>	<b>(count)</b>
No attempt to minimise tillage	25%	3
Less aggressive tillage options used	41.67%	5
No. 2 + Beds used for more than one season	16.67%	2
Permanent beds, controlled traffic, GPS	0%	0
Don't know – don't understand question	16.67%	2
<b>Totals</b>	<b>100%</b>	<b>12</b>

**Which of the following best describes the practices you use in the inter-row?**

	<b>Responses</b>	
	<b>(percent)</b>	<b>(count)</b>
Bare dirt and cultivation scuffling weeds	5%	1
Weed control by cultivation and herbicide	0%	0
Weed control mainly herbicide - min. tillage	60%	12
Protected by living or dead mulch	35%	7
Don't know – don't understand question	0%	0
<b>Totals</b>	<b>100%</b>	<b>20</b>

**Which of the following best describes the way you buffer run off from cultivation?**

	<b>Responses</b>	
	<b>(percent)</b>	<b>(count)</b>
No effort to capture or slow sediments	0%	0
Some grassed headlands, filter strips	55%	11
Filter strips (eg.) designed to take into account slope and soil type – following guidelines	25%	5
No 3. + designed (eg. Size) 'treatment wetlands'	15%	3
Don't know – don't understand question	5%	1
<b>Totals</b>	<b>100%</b>	<b>20</b>

**Which of the following best describes the way you manage overland flow?**

	Responses	
	(percent)	(count)
Overland flow is not managed at all	0%	0
Overland flow diverted from cropping areas	42.86%	9
Sediment traps in place to capture flow	52.38%	11
Don't know – don't understand question	4.76%	1
<b>Totals</b>	<b>100%</b>	<b>21</b>

**Do you manage the riparian zone of a creek or wetland ( the edge)**

	Responses	
	(percent)	(count)
No don't have a riparian zone	42.86%	9
Weed control undertaken in zone	9.52%	2
No. 2 + Riparian areas protected from stock	0%	0
Natural riparian zone protected and rehabilitated	38.10%	8
Don't know – don't understand question	9.52%	2
<b>Totals</b>	<b>100%</b>	<b>21</b>

**How frequently do you monitor your soil health? i.e. other than nutrients**

	Responses	
	(percent)	(count)
Never	24%	6
Occasional visual inspection for physical properties	40%	10
Regularly monitor the structure and biological health	28%	7
Don't know – don't understand question	8%	2
<b>Totals</b>	<b>100%</b>	<b>25</b>

**ABCD Nutrient Management**

**How do you apply fertilisers – timing and application?**

	Responses	
	(percent)	(count)
Before bedding up - mainly on surface	22.73%	5
Banded application split through crop cycle	4.55%	1
Banded, foliar, fertigation application split timing based on crop stage, irrigation , rainfall	45.45%	10
No 3. but predominant use of fertigation systems	27.27%	6
<b>Totals</b>	<b>100%</b>	<b>22</b>

**How frequently do you test for nutrients to inform your fertiliser rate?**

	Responses	
	(percent)	(count)
No testing of soil or plants	11.11%	2
Some soil and/ or leaf sap or leaf tissue testing	27.78%	5
Regular soil and tissue testing before each crop at paddock scale	38.89%	7
As No 3. but testing to pick up variations within paddock	16.67%	3
Don't know – don't understand question	5.56%	1
<b>Totals</b>	<b>100%</b>	<b>18</b>

**Which of the following best describes the way you determine fertiliser rates?**

	Responses	
	(percent)	(count)
Based on historic application rates and rules of thumb	7.14%	1
Based on industry recommendations	7.14%	1
Variable rates between paddocks based on soil tests.	35.71%	5
No 3 + qualified agronomist support, farm trials, nutrient budget (e.g. other inputs accounted for)	42.86%	6
Don't know – don't understand question	7.14%	1
<b>Totals</b>	<b>100%</b>	<b>14</b>

**How do you account for nutrients from other sources?**

	Responses	
	(percent)	(count)
No consideration of other nutrient sources	5%	1
Some consideration of the above	20%	4
Consideration of the above using average/ general nutrient data for this source	10%	2
Consideration of other inputs based on specific tests of their nutrient value on a regular basis.	60%	12
Don't know or do not use other source	5%	1
<b>Totals</b>	<b>100%</b>	<b>20</b>

**Which best describes your method of storing chicken litter or other manures?**

	Responses	
	(percent)	(count)
Placed close to waterways with no controls	11.11%	2
Placed away from waterways – no controls	33.33%	6
Stored in a facility to prevent or capture leachate pile	22.22%	4
Stored undercover in a bunded facility	0%	0
Don't know – or don't use litter	33.33%	6
<b>Totals</b>	<b>100%</b>	<b>18</b>

**How many of these practices covered by the previous questions have you improved since 2006?**

	Responses	
	(percent)	(count)
one practice	0%	0
two practice	0%	0
three practices	14.29%	2
four practices	7.14%	1
five practices	14.29%	2
six practices	0%	0
seven practices	21.43%	3
eight practices	14.29%	2
nine practices	14.29%	2
No practices	14.29%	2
<b>Totals</b>	<b>100%</b>	<b>14</b>

**Does everyone have a copy of Strawberry best soil, water and nutrient practices?**

	<b>Responses</b>	
	<b>(percent)</b>	<b>(count)</b>
Yes	78.95%	15
No	10.53%	2
No, can I have a copy	10.53%	2
<b>Totals</b>	<b>100%</b>	<b>19</b>